OPERATING INSTRUCTIONS

MODEL 67

REMOTE SIGNAL EXTENDER

HLI

HEKIMIAN LABORATORIES, INC.

15825 SHADY GROVE ROAD

ROCKVILLE, MARYLAND 20850 USA

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HEKIMIAN LABORATORIES, INC.
ROCKVILLE, MARYLAND 20850

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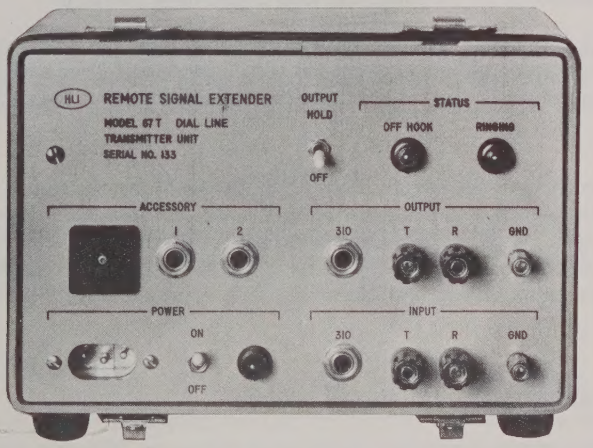
TABLE 1-1. SPECIFICATIONS

	Model 67T	Model 67R
INPUT		
Connection	Bridging (no ground required)	N/A
Impedance	Greater than 100K	600 ohm nominal
Level	N/A	AGC permits up to 20 dB line loss
Isolation	Fully floating with respect to ground	Fully floating with respect to ground
Protection	Withstands more than 600 volts	N/A
Polarity	Reversible, ring and tip interchangeable	Reversible, ring and tip interchangeable
Line Hold	N/A	Holding Coil
OUTPUT		
Impedance	600 ohm balanced	N/A
Level and Impedance	N/A	Compatible with any HLI Dialed Number Recorder
Isolation	Fully floating with respect to ground	N/A
Level	Identical to input	N/A
Line Hold	Holding Coil	N/A
DC Supervision	N/A	Polarity: Ring (R) connection grounded, dc supervision is positive with respect to ground.
DC Supervision Signaling Frequency	2100 Hz	N/A
ACCESSORY OUTPUTS		
Switched AC	115 VAC at 100 watts	115 VAC at 100 watts
Dry Contacts	2.0 Amperes maximum	2.0 Amperes maximum
Audio	600 ohm balanced, 0 dBm maximum	600 ohm balanced, 0 dBm maximum
DIAL LINE OPTION		
2600 Hz Conversion Frequency	400 Hz	N/A
POWER	105-125 VAC, 50-60 Hz, 9 watts	105-125 VAC, 50-60 Hz, 9 watts
DIMENSIONS	6" H x 9" W x 7½" D (with cover)	6" H x 9" W x 7½"D (with cover)
WEIGHT	7 lbs.	7 lbs.
TEMPERATURES		
Operating	0° to 50°C	0° to +50°C
Storage	−50° to +75°C	−50° to +75°

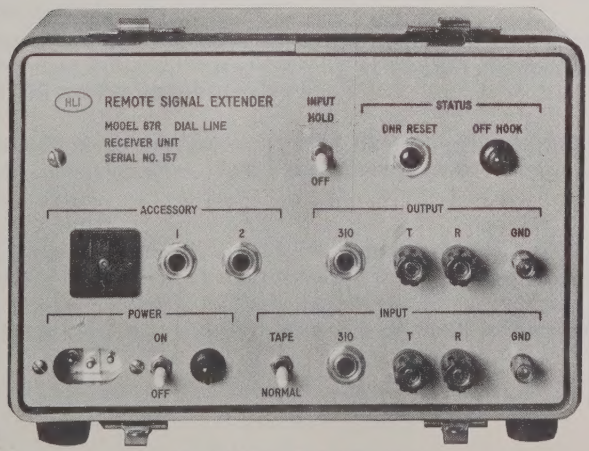
SECTION 1
INTRODUCTION

1.1 GENERAL DESCRIPTION

The Model 67 Remote Signal Extenders allow remote operation of the Hekimian Laboratories Dialed Number Recorders when hard wire (solid copper) connection to the subscriber loop is not available. A complete remote signal extender system consists of a Model 67T Transmitter Unit connected across the subscriber loop with its output transmitted over voice frequency telephone circuits to the remotely located Model 67R Receiver Unit which duplicates at its output the on/off hook, dial pulse information, ringing, subscriber generated signaling, and audio as monitored on the subscriber loop.



Model 67T Transmitter Unit



Model 67R Receiver Unit

Figure 1-1. Model 67 Remote Signal Extenders

When monitoring subscriber loops for suspected "blue box" fraud, a "Dial Line" option is available which prevents a subscriber generated SF signal from disrupting dial-up facilities used to connect the transmitter and receiver units.

The Model 67T Transmitter Unit provides a high impedance completely isolated and floating connection to the subscriber loop. It converts the dc supervision to an inband tone which is then transmitted with the subscriber generated inband signaling and audio from the subscriber loop to the Model 67R Receiver Unit. This unit regenerates the dc supervision and combines it with the signaling and audio signal so that the operation and printout of the HLI Dialed Number Recorder is the same as if it were connected directly across the subscriber loop.

Both Model 67 Remote Signal Extenders provide external AC power, dry contact and audio outputs controlled by the subscriber loop on/off hook condition.

The Receiver Unit incorporates automatic gain (AGC) to allow operation over voice channels with up to 20 dB of transmission loss. A single Receiver Unit may be switched between several remote Transmitter Units to monitor a number of widely separated subscriber loops.

Tape recordings made directly from subscriber loops may be played into the Receiver Unit/DNR combination to provide printouts of any recorded inband signaling (Touch-Tone ® and MF signals). Tape recordings made using a Transmitter Unit will also contain dc supervision, and when played through the Receiver Unit/Dialed Number Recorder will provide on/off hook, dial pulse, ringing, and inband signaling information from the subscriber loop.

1.2 SPECIFICATIONS

The mechanical and electrical specifications for the Model 67T Transmitter Unit and the Model 67R Receiver Units are contained in Table 1-1.

Photographs of the dial line version of the Model 67T Transmitter Unit and the 67R Receiver Unit are shown in Figure 1-1.

SECTION 2
INSTALLATION

2.1 INITIAL INSPECTION

The Model 67 Remote Signal Extender is designed for ease of operation and installation. After a unit has been removed from its shipping container, perform a complete visual inspection for possible damage. If damage is found, notify the carrier immediately; do not destroy any packing material until an agent of the carrier has examined it. Under U. S. shipping regulations, damage claims must be collected by the consignee. Do not return the instrument to Hekimian Laboratories, Inc. until a claim for damages has been established.

To inspect the interior of the units, open the cover and detach it from the case. Then remove the four screws on the rear, and remove the inner assembly from its case. Any damage due to shipping should be immediately reported to the shipping agency.

NOTE

All internal adjustments have been set at the factory and no further adjustment is required prior to installation and use of the units.

2.2 INSTALLATION

Primary power is supplied through the line cord packed in the compartmented cover of the transit case. The cover may be opened by squeezing the grey tabs of the two black fasteners holding the compartment lid. The cord is connected to the AC receptacle located on the front panel of the instrument.

Signal input/output lines are connected to the front panel binding posts or Western Electric 310 jacks as described in Section 3.

When possible shielded wires should be used for input and output connections to minimize signal pickup, however, in most applications ordinary twisted pair interconnect wire will be satisfactory.

In applications where the units are to be permanently installed, rack shelf adapters are available to allow installation of the unit in 19" wide or 23" wide relay racks, 7" of vertical rack space is required for each unit. When desired, input and output leads may be terminated in suitable jack fields or other convenient interconnect terminations.

SECTION 3
OPERATION

3.1 GENERAL

This section contains a description of the controls and indicators, and operating procedures to be used with the Model 67T Transmitter Unit and Model 67R Receiver Unit. Prior to operation, installation should be made in accordance with the instructions of Section 2, Installation.

3.2 CONTROLS AND INDICATORS

The controls and indicators used in operating the Remote Signal Extenders are described in Tables 3-1 and 3-2. All controls are located on the front panel. No internal adjustments are required.

TABLE 3-1. MODEL 67T TRANSMITTER UNIT CONTROLS AND INDICATORS

Designation	Function
Power Switch	Applies AC primary to the instrument.
Power Indicator	Lights to indicate application of power
Input Terminals and Jack	Provides bridging input connection for wire leads, clip leads, banana plugs, or Western Electric 310 plugs.
Output Terminals and Jack	Provides 600 ohm output signal to wire lead, clip leads, banana plugs or Western Electric 310 plugs.
Output Hold/Off Switch	Connects a holding coil across the voice channel tie line.
Status Indicators	
Off Hook	Lights to indicate off hook condition.
Ringing	Lights to indicate ringing.
Accessory Outlet	Provides 115 VAC to operate accessory when activated by off hook condition.
Accessory Jack No. 1	Closes pair of dry contacts (tip and ring) when off hook occurs.
Accessory Jack No. 2	Provides audio output (tip and ring) for monitoring.

TABLE 3-2. MODEL 67R RECEIVER
UNIT CONTROLS AND INDICATORS

Designation	Function
Power Switch	Applies AC primary to the instrument.
Power Indicator	Lights to indicate application of power.
Input Terminals	Provides 600 ohm input connection for wire leads, clip leads, banana plugs, or Western Electric 310 plugs.
Input Hold/Off Switch	Connects a holding coil across the voice channel tie line.
Output Terminals and Jack	Provides output connection for wire leads, clip leads, banana plugs. or Western Electric 310 plugs.
Status	
Off Hook	Lights to indicate off hook condition.
DNR Reset	Used for tape playback - push for on hook.
Accessory Outlet	Provides 115 VAC to operate accessory when activated by off hook condition.
Accessory Jack No. 1	Closes pair of dry contacts (tip and ring) when off hook occurs.
Accessory Jack No. 2	Provides audio output (tip and ring) for monitoring.
TAPE/NORMAL Switch	Provides off hook for anlyzing tapes made directly (without a Transmitter Unit), in TAPE position. NORMAL position provides for controlled supervision for use with Transmitter Unit or tapes made from a Transmitter Unit.

3.3 OPERATING PROCEDURES

This Section presents the operational procedures used with the Remote Signal Extender. These procedures are summarized in the Operating Instructions on the storage compartment lid located in the cover of the case.

3.3.1 Local Remote Operation

Basic remote operation involves a Transmitter Unit coupled to a Receiver Unit at a remote location by a voice channel. Figure 3-1 shows a Transmitter Unit, Receiver Unit, and Dialed Number Recorder connected for remote operation.

3.3.1.1 Transmitter Unit

Referring to Figure 3-1, the INPUT 310 jack or T and R binding post terminals are connected to the subscriber loop. Either polarity may be used and a ground is not required. The OUTPUT 310 jack or binding posts are connected to the voice channel tie line. The output is not polarity sensitive and a holding coil can be switched across the Transmitter Unit output terminals so that normal dial line telephone voice channels can be used between the units.

3.3.1.2 Receiver Unit

As shown in Figure 3-1, the INPUT 310 jack or T and R binding posts are connected to the voice channel link from the Transmitter Unit. Either polarity may be used and a holding coil can be switched across the input terminals for use on dial line telephone lines. The TAPE/NORMAL Switch is set to NORMAL position and the OUTPUT 310 jack or binding posts are connected to HLI Dialed Number Recorder INPUT terminals. The connection is not polarity sensitive and a ground is not required, however, one may be used if desired.

3.3.1.3 Dial Line Option

When the voice channel between the Transmitter and Receiver Units is a dial line facility that uses 2600 Hz interoffice signaling, units with the "Dial Line" option should be used. The Dial Line option prevents the presence of 2600 Hz on the subscriber loop from disconnecting the voice channel between the Transmitter and Receiver Units. Units with the Dial Line option are connected and used the same way as the standard units.

NOTE

Both Transmitter and Receiver Units must have the Dial Line option.

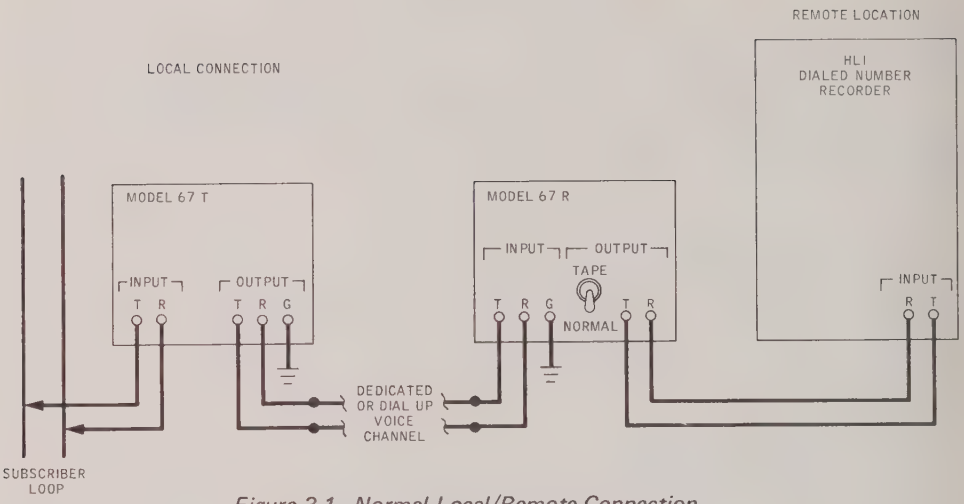


Figure 3-1. Normal Local/Remote Connection

3.3.2 Tape Recorders Use With Transmitter and Receiver Units

In cases where a real-time or live dialed number recording is not required, or where a suitable voice channel is difficult to establish, a tape recording can be made of the Transmitter Unit output. This recording will contain all dc supervision information including on/off hook, dial pulse numbers, and incoming call ringing, which would not be recorded by a normal tape recording. When the recording is later played back into the Receiver Unit input, a Dialed Number Recorder printout can be made. With the exception of the time of day, the Dialed Number Recorder printout will be the same as if it had been made directly across the subscriber loop. The connections for this operation are shown in Figure 3-2.

3.3.2.1 Transmitter Unit

As shown in Figure 3-2, the INPUT 310 jack or T and R binding post terminals are connected to the subscriber loop. Either polarity may be used and a ground is not required. The OUTPUT 310 jack or T and R binding posts are connected to the input of the tape recorder. The tape recorder may be powered by the accessory outlet, or the recording process controlled by Accessory Jack No. 1 (dry contact), so that tape recording is performed only when the subscriber loop is off hook.

3.3.2.2 Receiver Unit

As shown in Figure 3-2, the INPUT 310 jack or T and R binding post are connected to the output of the tape recorder. The TAPE/NORMAL Switch is set to NORMAL

position, and the OUTPUT 310 jack or binding posts are connected to HLI Dialed Number Recorder INPUT terminals. Either polarity may be used and a ground is not required.

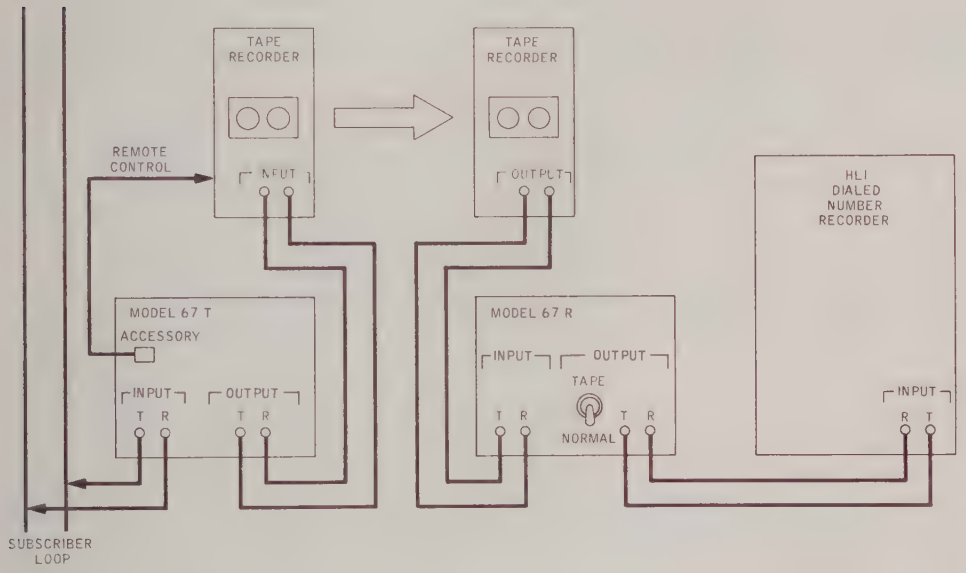


Figure 3-2. Tape Recorder Connection for On/Off Hook, Dial Pulses, Ringing, Inband Signaling and Audio

3.3.3 Tape Recorder Use Without a Transmitter Unit

In cases where it is not necessary to detect on/off hook information dial pulses, and ringing, a tape recording can be made directly from the subscriber loop without using a Transmitter Unit. Later when the tape recording is played into a Receiver Unit, inband signaling such as Touch-Tone ®, MF, and 2600 Hz SF will be decoded by an HLI Dialed Number Recorder. The connections for this operation are shown in Figure 3-3.

3.3.3.1 Receiver Unit

As shown in Figure 3-3, the tape recording is first made directly from the subscriber loop. To analyze the tape, connect the INPUT 310 jack or binding posts of the Receiver Unit to the output or the tape recorder. Place the TAPE/NORMAL Switch in TAPE position, and connect the OUTPUT 310 jack or binding posts to the input of the HLI Dialed Number Recorder.

Since recordings made directly do not contain the dc supervision, the DNR RESET must be pressed and released before the first Touch-Tone ® appears, and must be periodically pressed at 30 second intervals when Touch-Tone ® spacing is greater than 30 seconds. The DNR RESET button is pressed to simulate an on hook condition so that the Dialed Number Recorder will provide a time print and reset the signaling detectors.

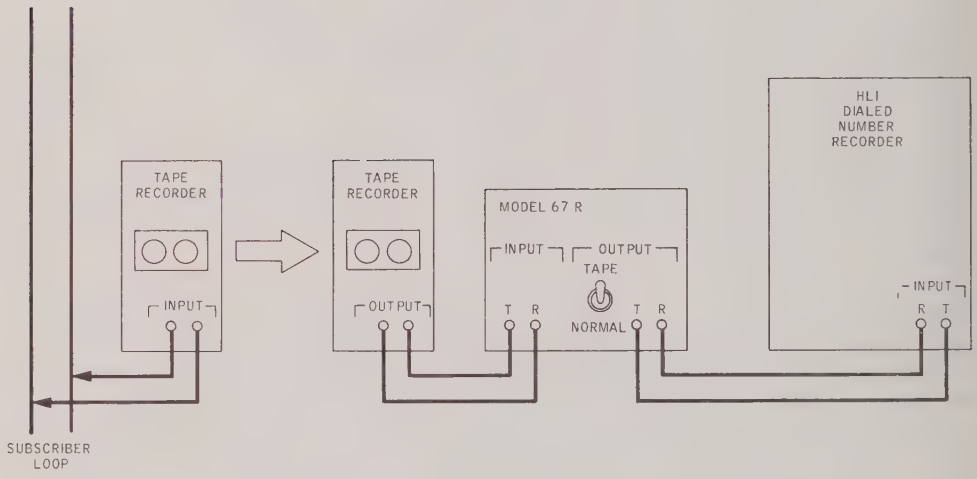


Figure 3-3. Tape Recorder Connection for Inband Signaling and Audio

SECTION 4
THEORY of OPERATION

4.1 GENERAL

The function of the Model 67T Transmitter Unit is to provide a high impedance isolated bridging connection to the subscriber loop and convert the dc supervision on this loop to inband signaling so that on/off hook, dial pulse information, and ringing as well as subscriber signaling and voice can be transmitted over any type of interconnecting voice channel facility.

The Model 67R Receiver Unit accepts the Transmitter Unit's signal at the remote location and detects the inband signaling to provide an output signal which duplicates the dc supervision, subscriber signaling, and voice at the remote location for use by any HLI Dialed Number Recorder.

4.2 MODEL 67T TRANSMITTER UNIT OPERATION

A block diagram of the Model 67T Transmitter Unit is shown in Figure 4-1. The subscriber loop is connected to a high impedance, dc/dc converter, which provides a fully floating polarity insensitive input. The converter output is connected to an automatic gain control circuit and the off hook detector.

The AGC circuit is used to limit the maximum signal excursions and drives the band reject filter which removes voice energy from the inband signaling frequency to prevent voice triggered "on hook" conditions at the Receiver Unit. The filtered signal is then connected to the output amplifier.

The off hook detector senses subscriber loop "off hook", dial pulse signals (rotary dialing), and ringing and its output controls the keyed signaling oscillator which places a 2100 Hz tone at the output during "on hook" conditions. It is pulsed by the dial pulse and ringing signals, but, otherwise is not present during the "off hook" condition.

The off hook detector provides the input signal to the ringing detector and indicator, and controls the "off hook" relay and accessory outputs.

Accessory Jack No. 1 and the Accessory Outlet are activated immediately when an "off hook" occurs; however, following an "on hook", they remain closed for approximately 5 seconds to allow a short period of "on hook" recording when the Transmitter Unit is used in making magnetic tape recordings.

The 600 ohm balanced output has a dc holding coil that can be switched in for use with dial up interconnections. The output voice level is the same as the subscriber loop voice level.

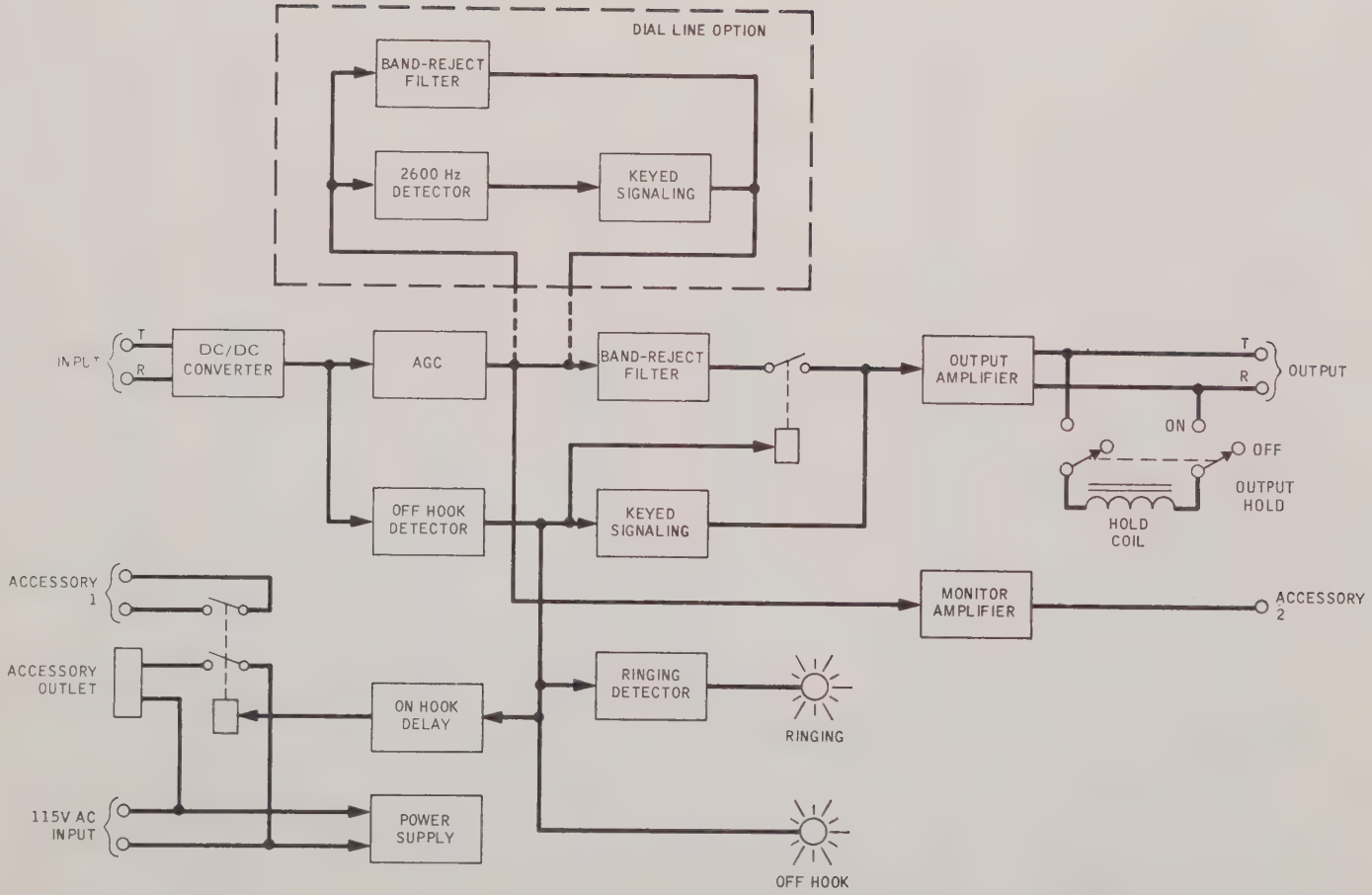


Figure 4-1. Model 67T Block Diagram

4.3 MODEL 67R RECEIVER UNIT OPERATION

A block diagram of the Model 67R Receiver Unit is shown in Figure 4-2. The incoming circuit is terminated in 600 ohms with a switchable holding coil. It is then transformer coupled to an automatic gain control (AGC) circuit which is used to compensate for up to 20 dB of line loss. The AGC drives the output amplifier and the signaling detector.

The output amplifier provides the audio signal to the Dialed Number Recorder. The monitor amplifier provides the drive for Accessory No. 2, Monitor Output.

The signaling detector senses the presence or absence of the 2100 Hz inband signaling tone from the Transmitter Unit and controls "on/off hook" and dial pulse supervision voltage at the output terminals.

The ringing detector senses ringing at the signaling detector output and activates the keyed ringing oscillator which places a 20 Hz ringing signal on the output terminals. This signal is designed to operate the ringing functions in the Dialed Number Recorder. However, it will not ring a conventional telephone set connected across the output terminals.

When playing back tape recordings, the tape position of the TAPE/NORMAL Switch forces a continuous "off hook" condition to provide proper operation of the Dialed Number Recorder. The NORMAL position allows the signaling detector to control the off hook encoder as previously described.

When pressed, the DNR RESET button overrides all other functions to produce "on hook" supervision at the output terminals. This is used to reset timing circuitry in the Dialed Number Recorder as described in Section 3.

The signaling detector also controls the Accessory No. 1 Dry Contact Switching and Accessory Outlet AC power through the "on hook" delay circuit. The accessory outputs are activated during an "off hook" condition.

4.4 DIALED LINE OPTION

When a dial up transmission circuit is used to connect the Transmitter and Receiver Units, it can be disrupted by the presence of 2600 Hz signaling on the subscriber loop. The dial line option is used to prevent this from happening. This option filters out the subscriber generated 2600 Hz signal applied to the Transmitter Unit and converts it to 400 Hz which is then transmitted through the interconnecting voice facility to the Receiver Unit. The Receiver Unit detects the presence of 400 Hz and places a 2600 Hz tone in the Receiver output to duplicate the conditions on the subscriber loop.

The following sections describe the operation of the dial line option. Block diagrams of this option are contained in Figures 4-1 and 4-2.

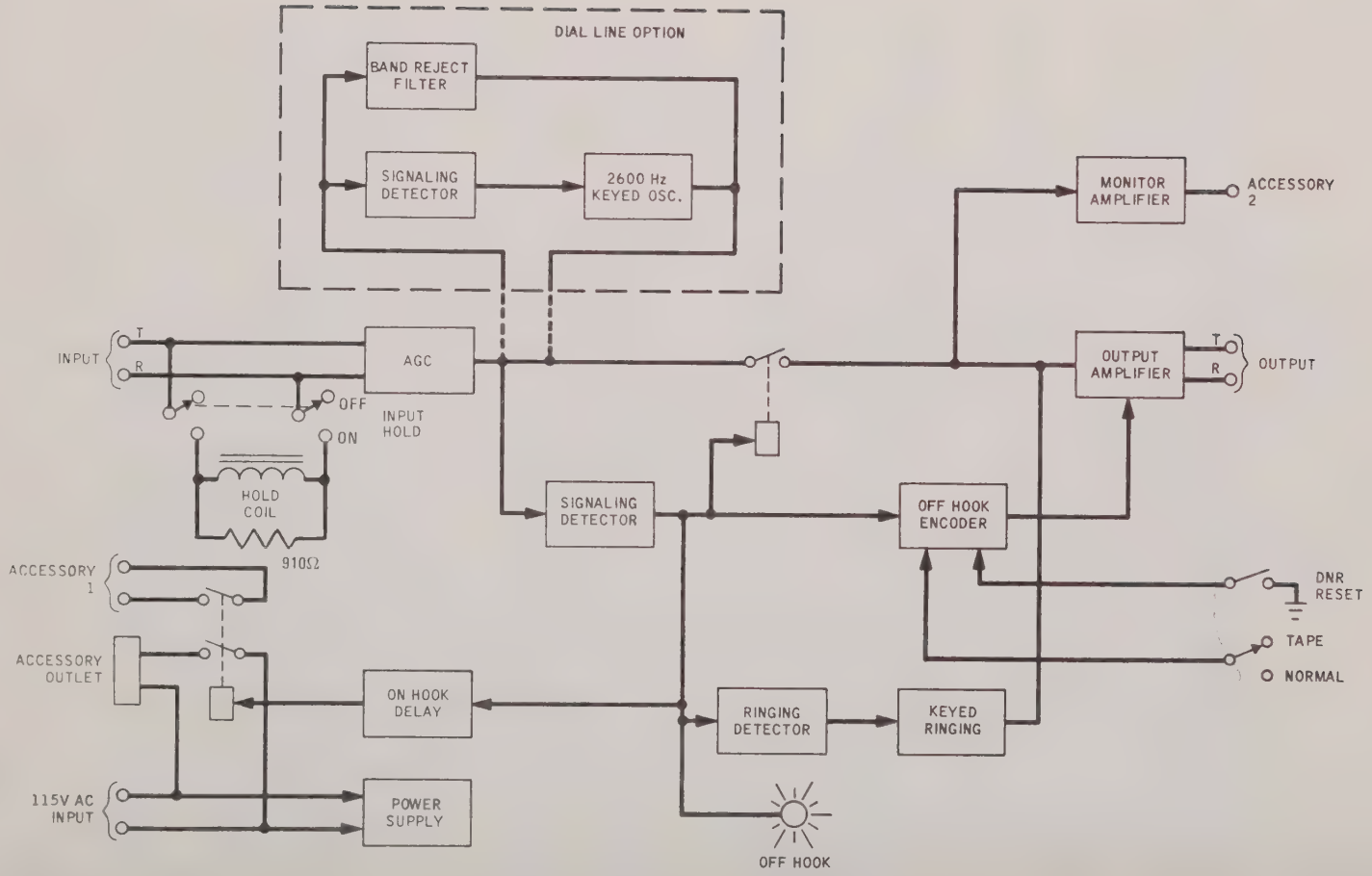


Figure 4-2. Model 67R Block Diagram

4.4.1 Transmitter Unit Option

In the Transmitter Unit, the dial line option takes the voice signal from the AGC circuit and detects the presence of 2600 Hz which turns on a 400 Hz keyed signaling oscillator. A band reject filter rejects the subscriber loop 2600 Hz signal and prevents it from appearing at the transmitter output terminals.

No additional controls are required when the dial line option is installed. All other functions of the transmitter remain the same as described in Paragraph 4.2

4.4.2 Receiver Unit Option

When installed in a Receiver Unit, the dial line option takes the signal from the AGC amplifier and detects the presence of the 400 Hz inband signaling tone. When the 400 Hz is present, a 2600 Hz keyed oscillator is connected to the output terminals.

A 400 Hz band reject filter is used to prevent the signaling tone from appearing at the Receiver Unit output terminals and guarding off the 2600 Hz, SF detection circuitry in the Dialed Number Recorder.

No additional front panel controls are required for the dial line option. All other functions of the Receiver Unit remain as described in Paragraph 4.3.

SECTION 5
MAINTENANCE

5.1 GENERAL

The maintenance procedures described in the following paragraphs are used by the operator and the maintenance personnel to verify proper operation of the units. If proper operation is not achieved, the defective unit should be returned to HLI for repair. The details of the HLI Warranty are contained on the last page of this manual.

Periodic cleaning, lubrication, or inspection of the Remote Signal Extenders is not required.

All of the following checks are made with a 33 ohm resistor connected across the input terminals of the Model 67R Receiver Unit.

5.2 CHECK OUT

Connect the input of the Model 67T Transmitter Unit to a real or simulated subscriber loop. Connect a rotary dial telephone set and a Touch-Tone ® telephone set to the subscriber loop.

Connect the output of the Transmitter Unit to the input of the Receiver Unit, and connect a HLI Dialed Number Recorder to the output of the Receiver Unit as shown in Figure 3-1. Set the TAPE/NORMAL Switch on the Receiver Unit to NORMAL position and plug night lights into the AC accessory outlet on the Transmitter and Receiver Units.

5.2.1 Check Out Procedure

With both telephone sets on hook, observe that the off hook indicators and the night lights are out. Place the TAPE/NORMAL Switch in TAPE position and note that the off hook indicator on the Dialed Number Recorder is turned on. Return to NORMAL position.

Take the dial telephone off hook and dial all ten digits. Go back on hook and observe that the Dialed Number Recorder prints out the same digits that were dialed.

Take the Touch-Tone ® telephone off hook and "dial" all twelve digits then go back on hook. Observe that the Dialed Number Recorder prints out the same digits that were dialed.

Ring the subscriber loop and note that the Ringing Indicator on the Transmitter Unit is lighted and that the Dialed Number Recorder has given a "ring" print out.

For Dial Line Units only, put a 2600 Hz tone into one of the telephones for about 1 second, and note that the Dialed Number Recorder gives a "2600 Hz" print out.

INSTRUCTION MANUAL

MODEL 67

REMOTE SIGNAL EXTENDER

MANUFACTURED BY

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